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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/862,452	05/23/2001	Tomoo Yamamoto	29273/550	8895

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EXAMINER	
UHLIR, NIKOLAS J	

ART UNIT	PAPER NUMBER
1773	

DATE MAILED: 08/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/862,452	YAMAMOTO ET AL.	
	Examiner	Art Unit	
	Nikolas J. Uhlir	1773	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *16-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *16-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 04/06/2004 has been entered. For clarity of the record, should the applicant have already received an office action (dated 07/08/2004) in response to the RCE, this office action supercedes the 07/08/2004 communication.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 24 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 24 requires the seedlayer to "substantially consist of" Ti and Al. The scope of the language "substantially consist of" is unclear. Does applicant mean "consists of," "consists essentially of," or "comprises?" The applicant is respectfully invited to call the examiner should the applicant have questions relating to the interpretations conventionally assigned to these terms.

Claim Rejections - 35 USC § 103

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 16-17, and 19-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong (US6558811) in view of Bertero et al. (US6150015).

5. It is noted that both the Wong and Bertero references were cited in a previous office action.

6. Claim 16 requires a magnetic recording medium comprising: a non-magnetic glass substrate, a seed layer formed on the non-magnetic glass substrate, a magnetic layer, and an underlayer formed between the seedlayer and the magnetic layer, wherein the seed layer is amorphous or microcrystalline and contains at least Ti and Al, said magnetic layer contains Co alloy, has an hcp structure and is oriented in the (11.0) direction relative to the plane parallel with the substrate, and said underlayer is oriented in the (100) direction relative to the plane parallel with the substrate.

7. Regarding these limitations, Wong teaches a magnetic recording medium having a substrate, a TiAl:N seedlayer (equivalent to applicants seedlayer) on the substrate, a $CrMo_{20}$ underlayer (equivalent to applicants underlayer) on the seedlayer, and a CoCrPtTa magnetic layer on the underlayer (see figure 2a). Further, in a separate embodiment, Wong teaches a Ti_3Al:N seedlayer on the substrate, a Cr first underlayer on the seedlayer, a $CrMo_{20}$ second underlayer on the first, a CoCrPtTa first magnetic layer on the second underlayer, and a CoCrPt second magnetic layer on the first magnetic layer. The substrate can be either nickel phosphorous or a ceramic glass (See column 1, lines 45-60 and figures 1-3c).

8. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a glass substrate as the substrate in Wong, as Wong

recognizes the equivalence of glass to NiP as a suitable material for forming the substrate.

9. Wong does not teach that the underlayer is oriented (100) relative to the plane parallel to the substrate, or that the magnetic layer is oriented (11.0) relative to the plane parallel with the substrate, as required by claim 16.

10. However, Bertero teaches a magnetic recording medium having a substrate, a Cr or Cr alloy underlayer on the substrate, a nucleation layer (of CoCrTa or CoCrPtTa alloy) on the Cr or Cr alloy underlayer, and magnetic layer (of CoCrPtTa alloy) on the nucleation layer (figure 4 and column 18, lines 24-35). The Cr or Cr alloy underlayer is grown such that it has a (200) orientation (equivalent to applicants (100) orientation relative to the plane to the plane parallel to the substrate). This nucleation layer provides a template for epitaxial growth of subsequent layers deposited on it, and promotes the in plane orientation of the magnetic layer (column 17, lines 25-45). Further, Bertero teaches that the lattice matching between a Cr or Cr alloy underlayer and a HCP Co based magnetic layer is improved by the CoCr based nucleation layer that is between the underlayer and the magnetic layer (column 12, lines 36-65). The structure of the nucleation layer and the improved lattice matching allows the magnetic layer to have its c-axis oriented in plane (column 13, lines 30-35). Bertero teaches that this process is suited to mediums utilizing a CoCrPtTa alloy magnetic layer, and teaches that when such a magnetic layer is utilized, the nucleation layer can be made without the Pt to conserve cost. In a specific example, Bertero utilizes a $CoCr_{15}Ta_4$ nucleation layer above a Cr seedlayer, and underneath a $CoCr_{15}Ta_4Pt_3$ magnetic layer

(column 13, lines 30-45). The magnetic layer and the nucleation layer exhibit a difference in lattice constant that is <0.5%, and thus the crystallinity of the magnetic layer is improved.

11. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the (200) oriented Cr or Cr alloy underlayer taught by Bertero as the Cr or Cr underlayer of Wong. Further it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the $CoCr_{15}Ta_4$ nucleation layer and $CoCr_{15}Ta_4Pt_3$ magnetic layer of Bertero in place of the magnetic layer of Wong.

12. One would have been motivated to make these modification in view of the following teachings: 1) The teaching in Wong of the use of a Cr or Cr alloy underlayer and a CoCrPtTa magnetic layer, and the teaching in Bertero that a (200) oriented Cr or Cr alloy underlayer promotes in plane orientation of a CoCrPtTa magnetic layer; 2) the teaching in Bertero that the use of CoCrTa nucleation layer between a (200) Cr or Cr alloy underlayer and a CoCrPtTa magnetic layer improves the crystallinity of the magnetic layer and allows the magnetic layer to exhibit good in-plane c-axis orientation; 3) The teaching in Bertero that by specifically utilizing a $CoCr_{15}Ta_4Pt_3$ magnetic layer above a $CoCr_{15}Ta_4$ nucleation layer, the difference in lattice constant between the magnetic layer and nucleation layer is reduced to <0.5%, which results in the magnetic layer exhibiting improved crystallinity.

13. Regarding the orientations of the underlayer and the magnetic layer required by claim 16. Though the Cr or Cr alloy underlayer of Wong as modified by Bertero is

specifically taught to have a (200) oriented plane, this plane is crystallographically equivalent to a (100) plane. The only difference between a (200) plane and a (100) plane is the position of the plane relative to the origin of the particular unit cell being considered. Thus, the underlayer orientation required by claim 16 is met. With respect to the (11.0) orientation of the magnetic layer. Though this orientation is not specifically taught, the examiner takes the position that this limitation would be necessarily met. It is conventionally known in the art that underlayers in magnetic recording media are templates for epitaxial growth. This is discussed in the Bertero reference (see column 3, line 65-column 4, line 26). Further, the magnetic layer is an alloy having a composition that is substantially similar to that required by claim 20. Thus, in view of the similarities in magnetic layer alloy composition between the cited prior art and the instant application, and in view of the fact that the magnetic layer is grown over a Cr or Cr alloy underlayer having the same orientation as that required by the instant application, the examiner takes the position that the crystallographic orientation of the magnetic layer required by claim 16 is met.

14. Claim 17 requires the underlayer to contain Cr or a Cr alloy. This limitation is met as set forth above.

15. Claim 19 requires 2 underlayers to be used, a first underlayer containing Cr or CrTi and a second underlayer containing at least one of Cr, Nb, Mo, Ta, W, and Ti. This limitation is met as set forth above. The Cr or Cr alloy underlayer is equivalent to the 1st underlayer; the CoCrTa nucleation layer is equivalent to the 2nd underlayer.

16. Claim 20 requires one or more underlayers on the seedlayer, and requires the magnetic layer to contain at least 0.5-8.0 at. % of at least one element selected from the group consisting of C, B, Si, and Ta. This limitation is met as set forth above. The magnetic layer of Wong as modified by Bertero is a $CoCr_{15}Ta_4Pt_3$ alloy.

17. Claim 21 requires one or a plurality of intermediate layers containing Co and Cr to be formed on one or a plurality of underlayers. This limitation is met as set forth above. The Cr or Cr alloy underlayer of Wong as modified by Bertero is equivalent to the one or plurality of underlayers. The CoCrTa nucleation layer of Wong as modified by Bertero is equivalent to the claimed one or plurality of CoCr containing intermediate layers.

18. The limitations of claim 22 are process limitations in a product claim and do not appear to be further limiting insofar as the structure of the product. Even though product claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). See MPEP § 2113. Accordingly, the limitations of claim 22 are met as set forth above.

19. Claim 23 requires the surface of the amorphous or microcrystalline seedlayer to be oxidized or nitrided. Wong teaches the use of a nitrided TiAl seedlayer (column 3, lines 35-55). Thus, this limitation is met.

20. Claim 24 requires the seedlayer to "substantially consists of" Ti and Al. The examiner interprets "substantially consists of" to mean, "comprises," as the scope of the language "substantially consists of" is unclear. Bearing this in mind, this limitation is met as set forth above.

21. Claim 25 requires a magnetic recording device that utilizes a medium having the same limitations as claim 16. The device is further required to have a driver for driving the medium, a magnetic head having a recording and reproducing section containing a magnetoresistive sensor, a device for moving the head relative to the medium, and a read/write waveform processing input and output signals from the magnetic head.

22. While Wong does not teach a device meeting the limitations of claim 25, Bertero teaches a magnetic recording/reproducing apparatus that incorporates a magnetoresistive head that is suitable for recording and reproducing information from a medium utilizing a CoCrPtTa magnetic layer, as shown at column 21, lines 44-54. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the apparatus taught by Bertero with the recording medium taught by Wong as modified by Bertero, in view of the teaching in Bertero that such an apparatus is suitable for recording/reproducing data from magnetic recording media utilizing a CoCrPtTa magnetic layer. While the claimed device for moving the head relative to the medium and the signal processing waveform are not shown, these are conventionally known components of magnetic recording devices and would be necessarily/ordinarily present in such a device.

23. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wong as modified by Bertero as applied to claim 16 above, and further in view of Suenaga (5131995).

24. Wong as modified by Bertero do not teach the use of a TiAl seedlayer having 35-65 at. % Ti and 35-65 at. % Al., as required by claim 18.

25. However, Suenaga teaches that TiAl coatings for magnetic recording media substrates must have a hardness of at least 250 Hv to be viable (column 5, lines 42-53). In specific examples, Suenaga teaches that TiAl has an Hv of 200, Ti_3Al has a hardness of 250Hv, and Al_3Ti has a hardness value of 260Hv (column 4 table 1). It is clear from these examples that the composition of the titanium aluminum alloy has an impact on the hardness of the alloy, with hardness increasing as the concentration of aluminum or titanium in the alloy increases.

26. Therefore the examiner takes the position that the composition of the titanium aluminum alloy utilized as the seedlayer in Wong as modified by Bertero is a results effective variable. It would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the concentration of Ti and Al in the alloy within the range of 3:1 Ti:Al to 1:3 Ti:Al in order to obtain a TiAl alloy having a desired level of hardness.

27. Claims 26-27 rejected under 35 U.S.C. 103(a) as being unpatentable over Wong as modified by Bertero as applied to claim 25 above, and further in view of Rubin et al. (US6421195).

28. Wong as modified by Bertero fails to teach the type of magnetoresistive head required by claims 26 (spin valve) and 27 (tunnel effect).

29. However, Rubin teaches that suitable heads for longitudinal magnetic recording include spin valves, magnetoresistive heads, tunnel junctions (equivalent to applicants claimed tunnel effect type head), or inductive read heads (column 5, lines 10-31).

30. Therefore it would have been obvious to one of ordinary skill in the art to utilize a spin valve or tunnel effect type sensor as taught by Rubin as the magnetic head utilized in Wong as modified by Bertero, as these head structures are recognized as equivalent for use in recording and reproducing on longitudinal magnetic recording media.

Response to Arguments

31. The examiner notes that applicant's submitted no arguments with respect to the previous grounds of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nikolas J. Uhlir whose telephone number is 571-272-1517. The examiner can normally be reached on Mon-Fri 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Deborah Jones, can be reached on 571-272-1535. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

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Nju

D. S. NAKARANI
PRIMARY EXAMINER